

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



Biological considerations of Fixed Prosthodontics

Presented by

Dr. Mohammed Hosny

Lecturer of Crowns and Bridges

Faculty of Dental Medicine

AlAzher University

- Biological consideration during tooth preparation.
- Biological effect of various restorations and materials used.
- Biological consideration after tooth preparation.
- Biological consideration during cementation.
- Split- tooth syndrome.

I- Biological consideration during tooth preparation.

A- Prevention of damage during tooth preparation

- *1- Adjacent teeth*
- *2- Soft tissue*
- *3- Pulp*

B- Conservation of tooth structures

- *1- Partial coverage rather than complete coverage*
- *2- Minimal practical convergence angle*
- *3- Occlusal reduction follows anatomical plane*
- *4- Even axial reduction as possible*
- *5- Selection of conservative margin as possible*
- *6- Avoidance of apical extension of the preparation*

C- Consideration affecting future dental health

- *1- Axial reduction*
- *2- Margin placement*
- *3- Margin adaptation*
- *4- Margin geometry*
- *5- Occlusal considerations*
- *6- Preventing tooth fracture*

Why do we need to cut teeth in order to make crowns?

- Make room for an adequate and uniform layer of restorative material
- Create resistance & retention form, to prevent sucking out, twisting off and rotation
- Provide a strong, stiff, wear resistant crown
- Give good aesthetic result
- Create healthy, maintainable & inspect-able crown / tooth margin with good seal
- Provide a foundation on healthy strong tooth
- Allow correct technical procedures in the lab

I- Biological consideration during tooth preparation.

A- Prevention of damage during tooth preparation

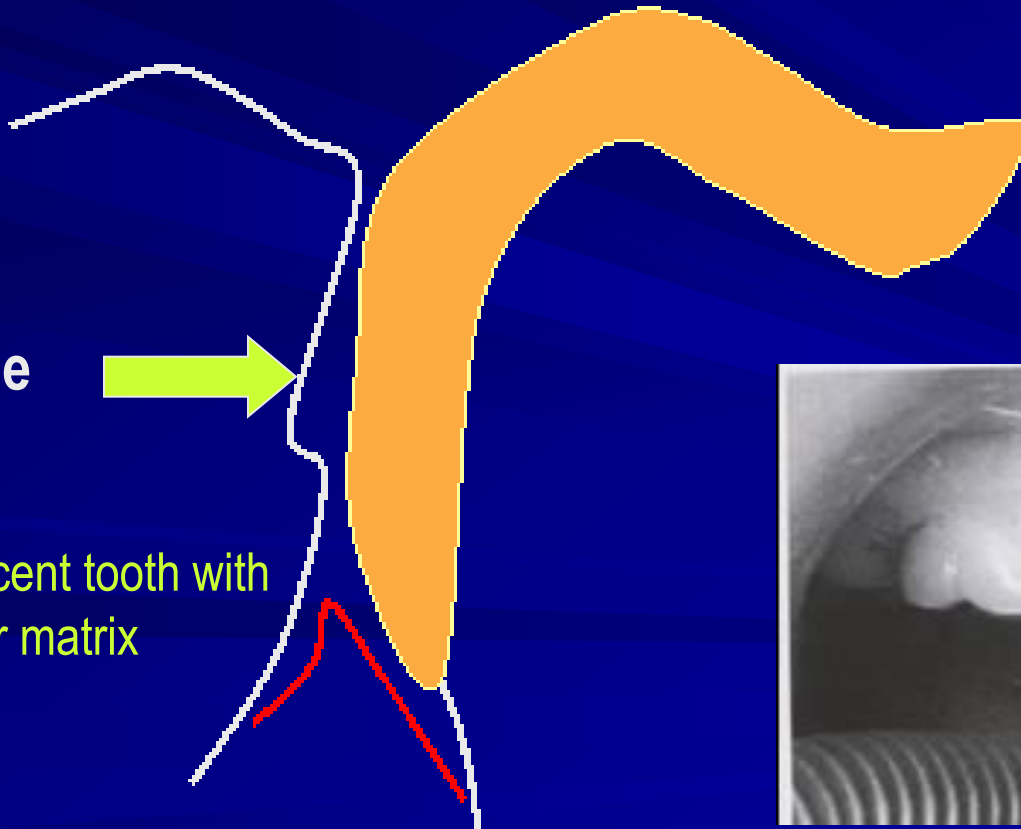
- 1- Adjacent teeth***
- 2- Soft tissue***
- 3- Pulp***

– 1- Adjacent teeth

Easily done



Protect adjacent tooth with
metal strip or matrix



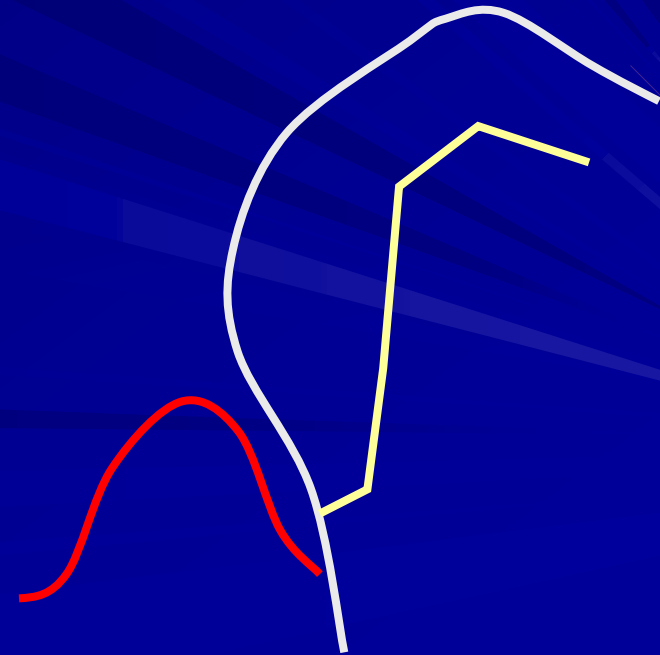
– 2- *Soft tissue*

- *Mouth mirror*
- *flanged saliva ejector*
- *Clamps and rubber dam*

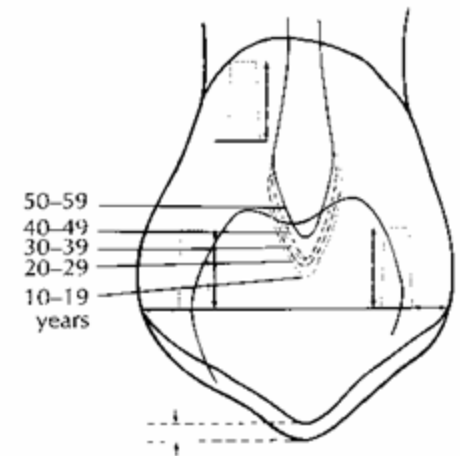
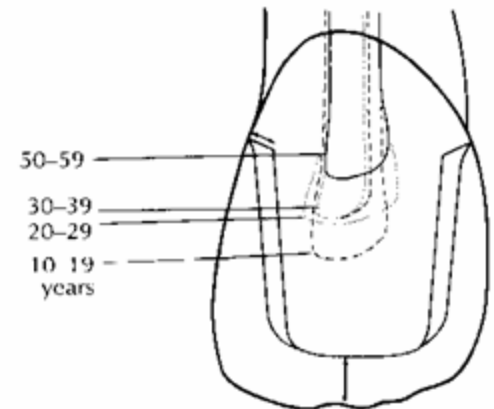
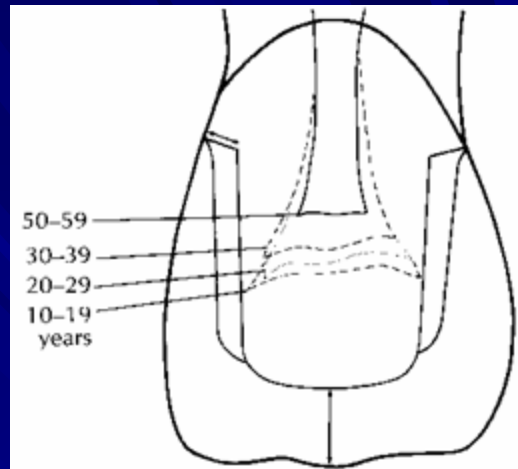
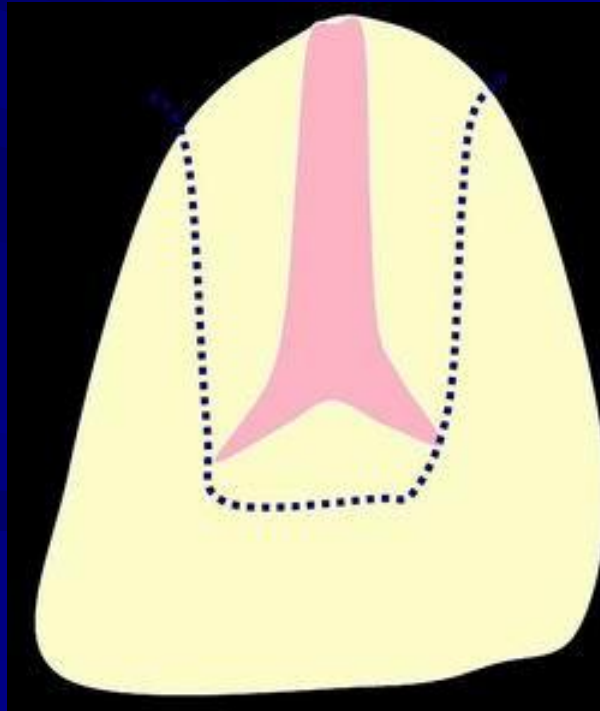


**Direct trauma, more likely
with**

- sub gingival margins
- Perio disease
- Careless cutting
- Aggressive use of retraction cord



-3- Pulp



Causes of pulp injury

a- Temperature

b- Chemical action

c- Bacterial action

d- Amount of dentine removed during preparation.

e- Morphology of pulp chamber and size of pulp.

a-Temperature

- Heat generation may be increase due to:-
 - Excessive pressure
 - High rotational speeds
 - Type and condition of the cutting instruments

- **To decrease heat generation, special precautions should be considered :**
 - The use of light and intermittent pressure during tooth preparation to minimize heat production.
 - Prevention of the use of dull rotary instruments.
 - With the use of high-speed handpiece, a light touch allows efficient removal of tooth structure with minimal heat generation. However, a water spray is mandatory to minimize heat generation. The water spray must be directed at the area of contact between tooth and bur.

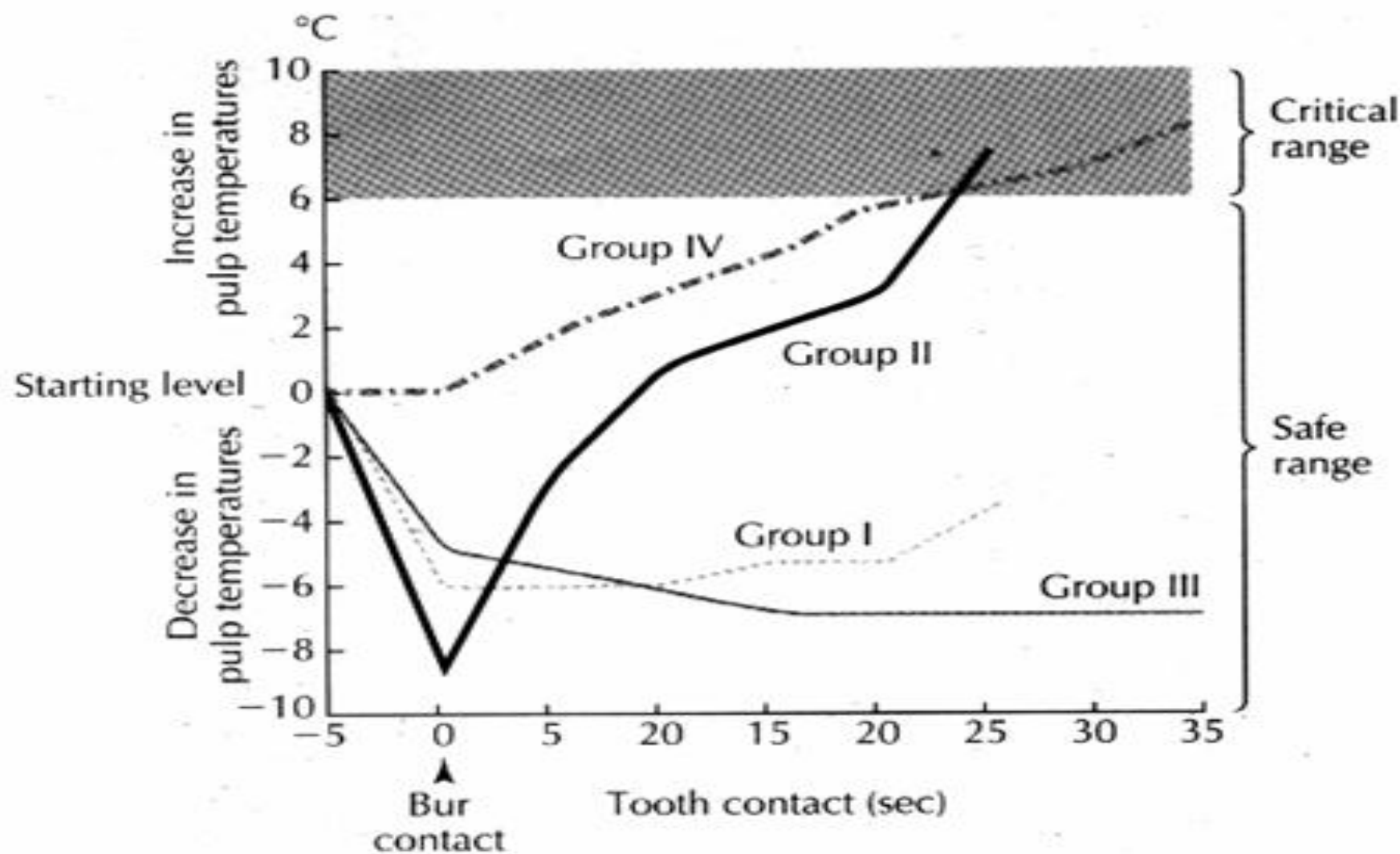


Fig. 7-5. Pulpal temperature rise during tooth preparation. Group I, air turbine, water cooled. Group II, air turbine, dry. Group III, low speed, water cooled. Group IV, low speed, dry.

b- Chemical action

- The chemical action of certain dental materials e.g. bases, restorative resins and luting agents can cause pulpal damage particularly when they are applied to freshly cut dentin.
- Acid cleaner

c- Bacterial action:

- Pulpal damage under restorations has been attributed to bacteria that either were left behind or gained access to the dentin because of microleakage. Therefore all carious dentin should be removed before placing a restoration that will serve as a foundation for a fixed prosthesis.
- Indirect pulp cap not recommended.

d- Amount of dentin removed during preparation:

- It appears that the more closely the preparation approaches the pulp, the greater is the degree of pulp damage, both during tooth preparation and in response to subsequent procedure including lining and cementation.
- Thus, the minimum amount of dentin should be removed that is consistent with the prevention of further caries, retention of the restoration and the strength of the material to be used.

e- Morphology of pulp chamber and size of pulp:

- When a vital pulp is to be retained within the crown preparation, the dentin must be preserved to protect it. The thickness of this layer of dentin will depend upon the age of the patient and the type of the preparation.
- There is a relationship between age of patient and size of the pulp. Pulp size decreases by age.

The size of the pulp will be estimated by:

- Good radiographs. This will be an approximate estimation.
- The size of the pulp will be determined by the condition that necessitated the crown preparation.

B- Conservation of tooth structures

- 1- *Partial coverage rather than complete coverage*
- 2- *Minimal practical convergence angle*
- 3- *Occlusal reduction follows anatomical plane*
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- 6- *Avoidance of apical extension of the preparation*

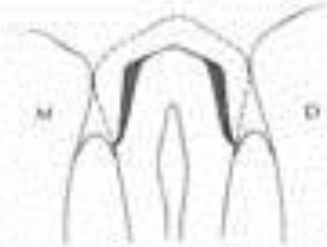


Fig. 7-9. Excessive taper results in considerable loss of tooth structure (shaded area).

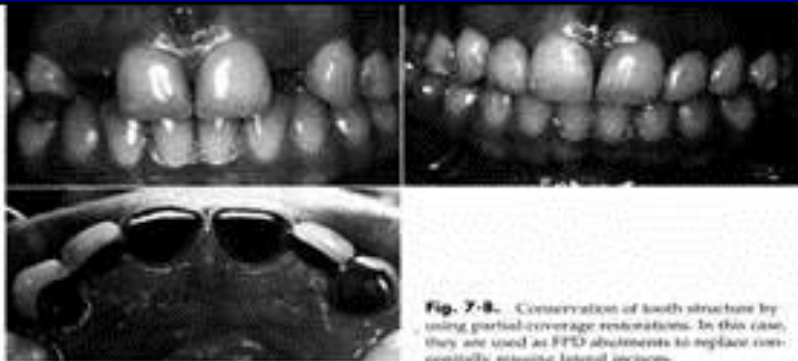
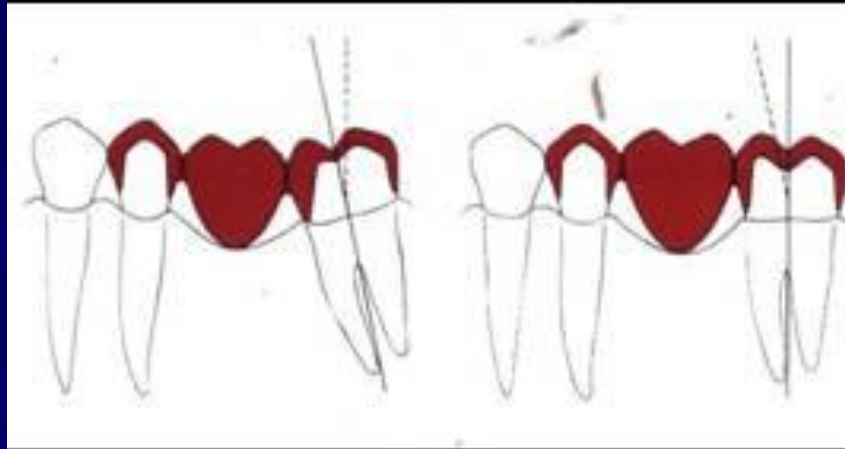


Fig. 7-8. Conservation of tooth structure by using partial-coverage restorations. In this case, they are used as FPD abutments to replace congenitally missing lateral incisors.

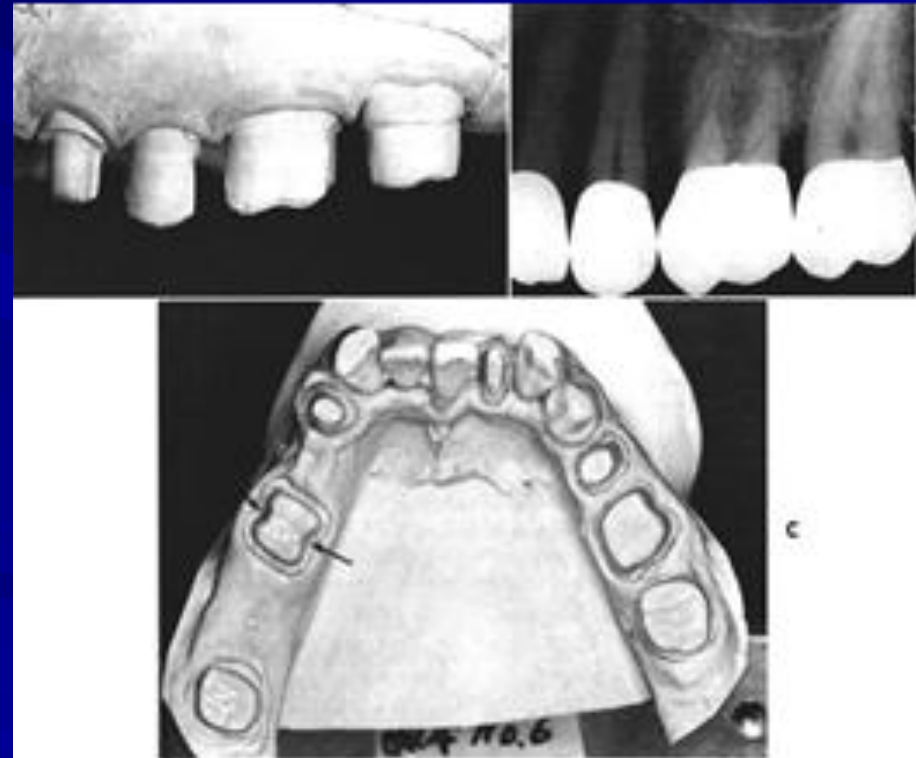


Minimally required clearances:
Buccal cusp—1.5 mm
Lingual cusp—1.0 mm
Marginal ridges and tissue—1.0 mm



C- Consideration affecting future dental health

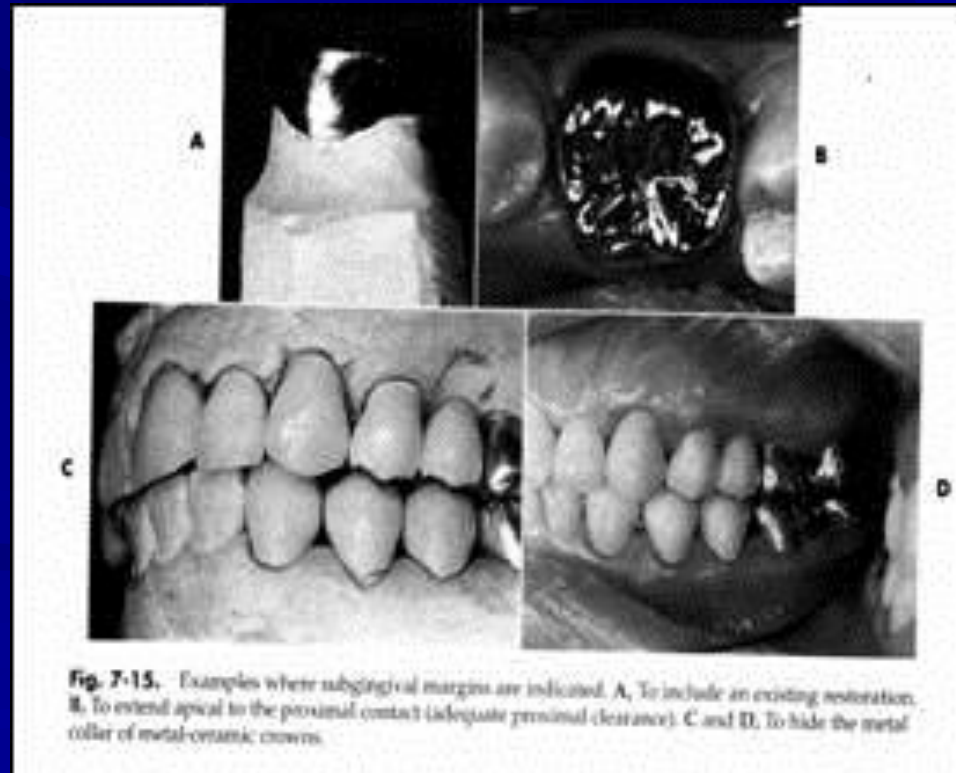
– 1- *Axial reduction*



– 2- Margin placement

Advantages of superagingival margins

Easily finished , kept clean, impressed, evaluated at recall



Sub gingival finish line is indicated in certain conditions as :

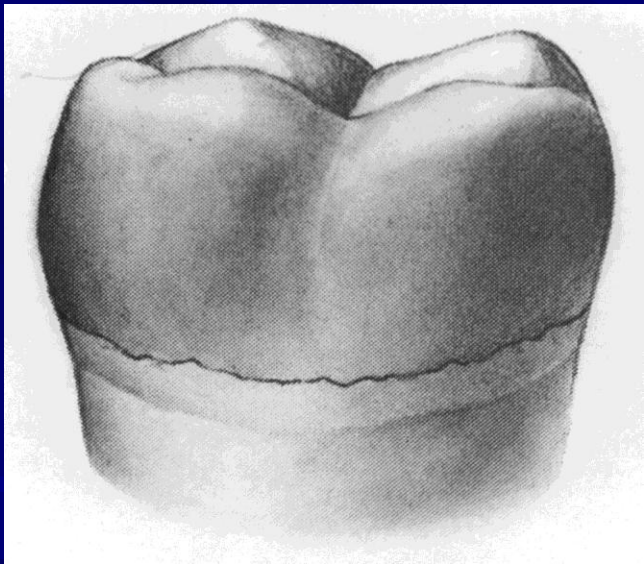
- In esthetic areas, where the margin of a metal-ceramic crown is to be hidden behind the gingival crest.
- Short occlusogingival height.
- Dental caries, cervical erosion, and restoration extending subgingival.
- The proximal contact area extends to the gingival crest.
- Root sensitivity that cannot be controlled by conservative procedures as application of dentin bonding agent.



Subgingival finish line in esthetic area

– 3- *Margin adaptation*

The more accurately the restoration is adapted to the tooth the lesser the chance for recurrent caries and periodontal diseases



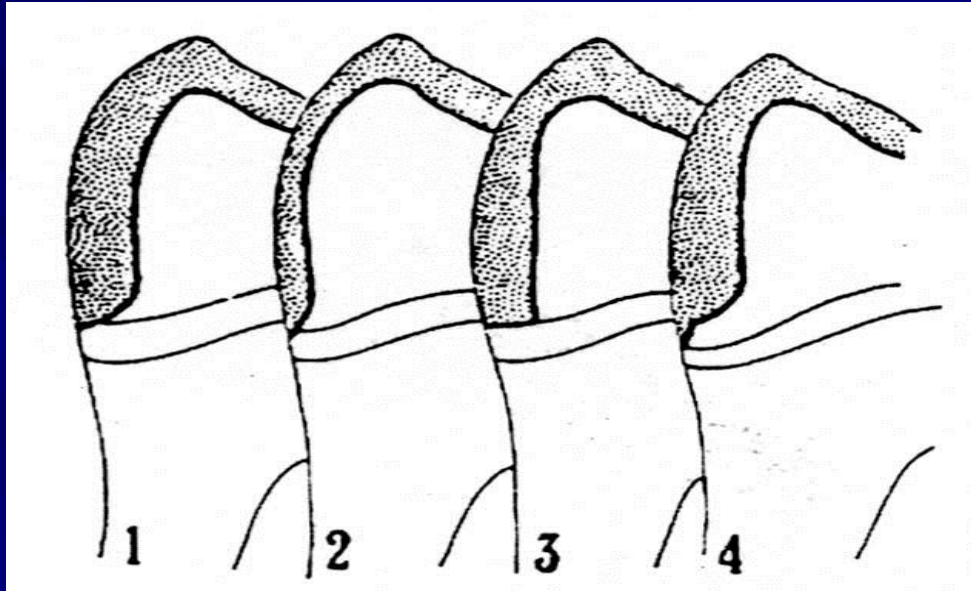
Rough irregular margin will prevent •
fabrication at an accurately fitted
restoration.



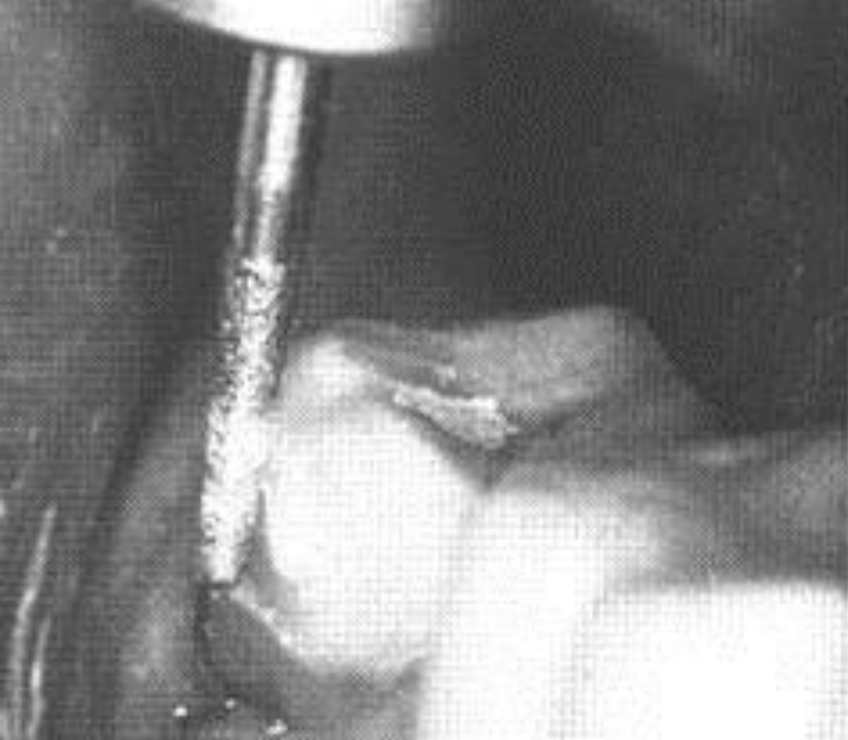
Smooth margin ensures a •
well fitted restoration

– 4- *Margin geometry*

■ Type of finish line



1. Chamfer finish line.
2. Knife edge finish line.
3. Shoulder finish line.
4. Shoulder with bevel finish line.



Chamfer margins indicated for cast metal crowns and lingual aspect of metal-ceramic

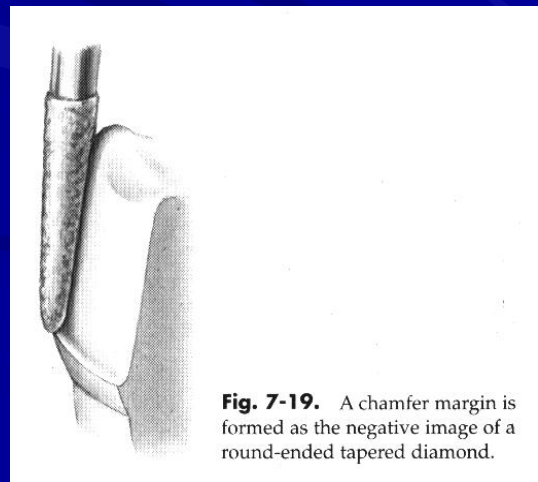
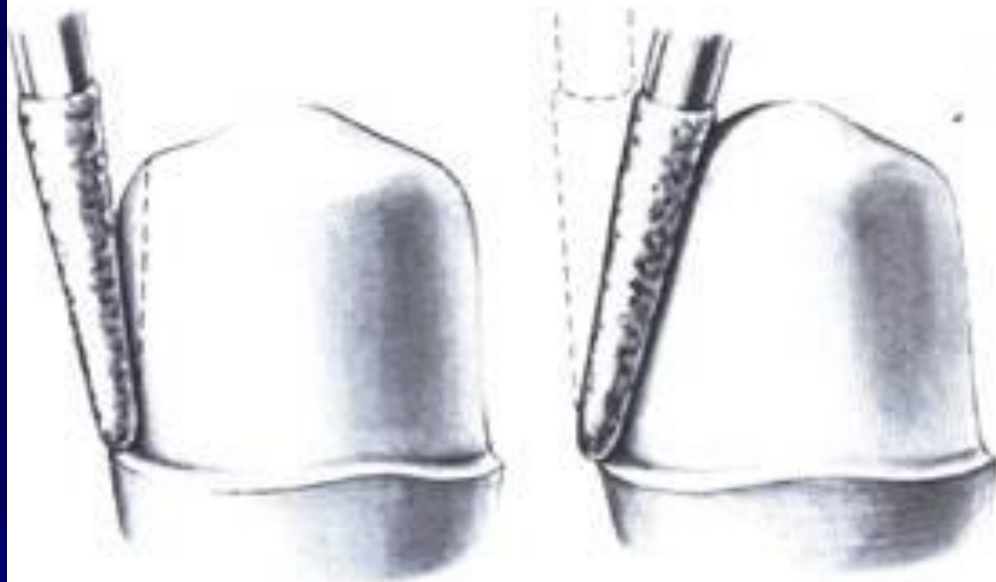


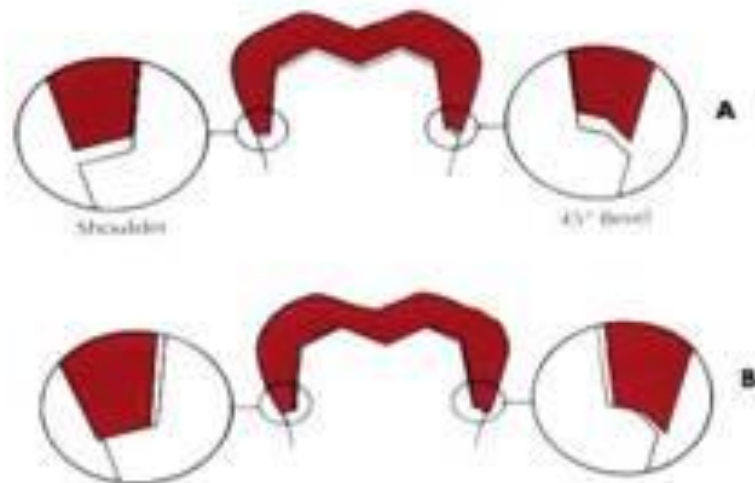
Fig. 7-19. A chamfer margin is formed as the negative image of a round-ended tapered diamond.



At left, the diamond is tipped away from the path of placement, resulting in an undercut; at right, the diamond is tipped into the tooth too far, leading to an excessively tapered preparation.



All unsupported enamel must be removed.



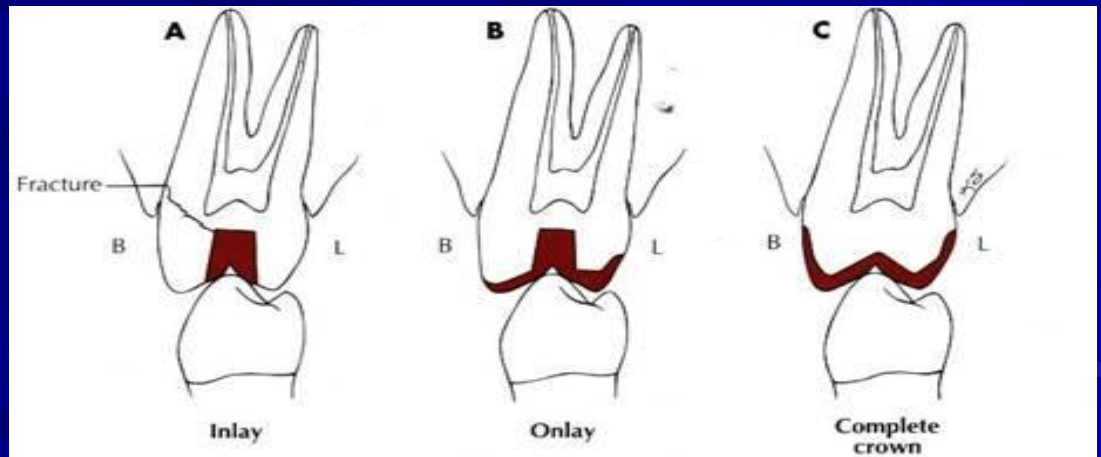
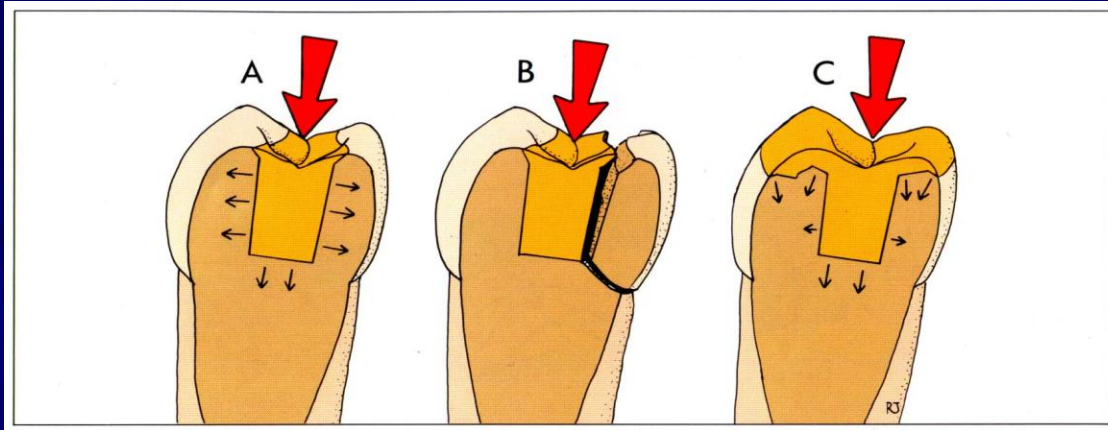
Properly seated castings should have minimal marginal gap widths.

– 5- Occlusal considerations

- When these teeth are prepared for restoration, the occlusal plane must be carefully analysed and the teeth reduced accordingly.
- Considerable reduction is needed to compensate for the supraeruption of abutment teeth. Sometimes even endodontic treatment is necessary to make enough room.



– 6- Preventing tooth fracture



Cuspal protection becomes more important as the structural durability of the cusps is compromised.

II-Biological effect of various restorations and materials used.

1-Silver amalgam → sulfide in saliva cause oxidation and corrosion

2-Bases and liners

3- Fluorides

4-Composite resins

5-Alloys

a - Gold casting

Highly polished gold surface not irritate gingiva and plaque accumulation.

b – Base metal alloys

Ni-Cr → Ni cause allergic reaction in soft tissue in 4.5% of population

Nickel

- Nickel is the **most allergenic** metal known.
- Hypersensitivity to nickel is more **common** in women.



- The reaction resemble **periodontal inflammation** but, they may occur primarily outside the mouth.



- Ni-based alloy; highest corrosion tendency and release of Ni ions after storage at PH 1-4.



- A study with 60 persons documented that, Ni has the highest allergic potency, followed by K ,Co ,Ag ,Cu ,Pd ,Pt and Au.

Ni

K

Co

Ag

Cu

Pd

Pt

Au

High to low

6- Veneering materials:-

▶ Porcelain

Highly glazed → tolerant not irritate gingiva and plaque accumulation.

▶ Acrylic resin → low wear resistance → Cervical discoloration

7- Gloves

Prefer vinyl gloves than latex gloves due to sulfur content.

8- Impression materials

Alginate → dust free because inhalation cause lung abscess

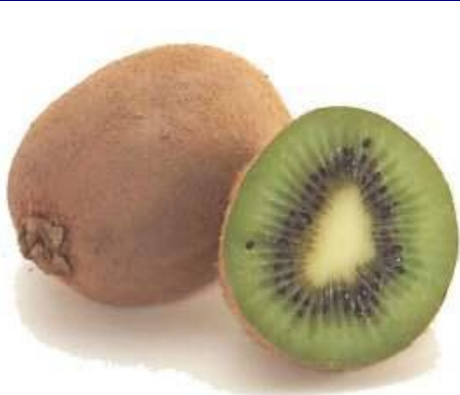
■ Is a naturally polymeric material isolated from the *Hevea Brasiliensis* tree .

■ FDA estimated that about 6% to 7% of surgical person may be **allergic** to latex.



Latex –fruit syndrome

- Patient with latex sensitization may experience a severe allergy after ingestion of some fruits and vegetables, due to cross reactivity between latex allergens and plant-derived food allergen.



III- Biological consideration after tooth preparation.

- Gingival displacement
- Impression materials and technique
 - Copper band
 - Catalyst of polyether cause allergic reaction and redness of oral mucosa
- Biological effects of temporary crowns and bridges.



IV-Biological consideration during cementation.

- Zinc phosphate cement.
- Zinc poly-carboxylate cement
- Zinc oxide- Eugenol
- Glass Ionomer cement
- Resin luting cements

V- Split- tooth syndrome

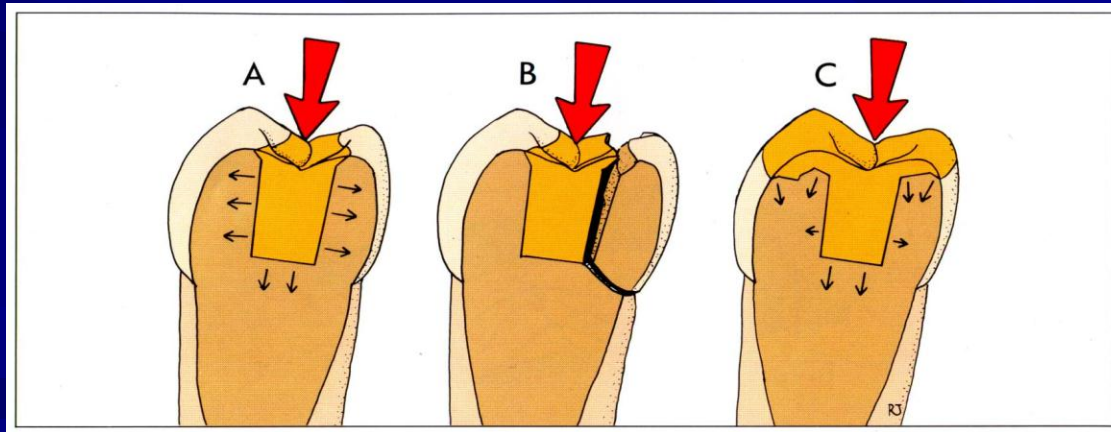
- 1- Cracked enamel
- 2- Cracked cusps
- 3- Crazing of dentin
- 4- split crown and root

1- Cracked enamel

- Cracks in enamel (incisal chipping) caused by age blows biting on nuts
- Very painful
- ttt → topical application of fluoride

2- Cracked cusps

- Caused by –overexpansion of amalgam or undermined cusps
- ttt → onlay



3- Crazing of dentin

- Occur in dentin in form of hairlike multiple separation
- Caused due to pins insertion.

4- split crown and root

- Occurred due to excessive forces at deep filled premolars.
- Split root due to over sized post insertion.
- ttt → split crown and root tied by crown
→ extraction

THANK YOU